

LLNL Environmental Restoration Division (ERD)  
Standard Operating Procedure (SOP)

**ERD SOP 1.12: Surface Soil Sampling—Revision: 2**

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**1.0 PURPOSE**

The purpose of this SOP is to describe the collection of representative surface soil samples for analysis of chemical, radiological, or physical parameters.

**2.0 APPLICABILITY**

This procedure is applicable to the development of surface soil sampling plans and the collection of surface soil samples independent of drilling operations, although the techniques described herein are also valid within that context. SOP 1.2, "Borehole Sampling of Unconsolidated Sediments and Rock," describes soil sampling during drilling in detail. Depending on the purpose of the sampling activity, modifications to these procedures can be made on a case-by-case basis and should be documented in a sampling plan.

**3.0 REFERENCES**

- 3.1 LLNL Health and Safety Manual.
- 3.2 Operational Safety Procedures (OSPs).

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- 3.3 Site 300 Site Safety Plan (SSP).
- 3.4 Livermore Site Safety Plan (SSP).
- 3.5 U.S. Environmental Protection Agency (1987), *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001.
- 3.6 Webster-Scholten, C. P., Ed. (1994), *Final Site-Wide Remedial Investigation Report, Lawrence Livermore National Laboratory*, Livermore, CA. (UCRL-AR-108131).

## **4.0 DEFINITIONS**

See SOP Glossary.

## **5.0 RESPONSIBILITIES**

### **5.1 Division Leader**

The Division Leader's responsibility is to ensure that all activities performed by ERD at the Livermore Site and Site 300 are performed safely and comply with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

### **5.2 Data Management Team (DMT)**

The DMT's responsibility is to decode the blind QC sample identification names on the analytical results, and distributing the data to appropriate personnel. DMT is responsible for archiving surface soil sampling plans and approving sample location names.

### **5.3 Field Personnel**

The field personnel's responsibilities are to perform the surface soil sampling activities in accordance with approved SOPs and sampling plans. Field personnel are responsible for packaging, handling, and shipping surface soil samples per SOP 4.2, "Sample Control and Documentation," SOP 4.3, "Sample Containers and Preservation," and SOP 4.4, "Guide to the Handling, Packaging, and Shipping of Samples." The field personnel are also responsible for obtaining permission to travel offroad, if sampling locations necessitates travelling more than 25 ft off pavement. Refer to SOP 4.1, "General Instruction for Field Personnel".

### **5.4 Subproject Leader (SL)**

The SL or designee are responsible for preparing a surface soil sampling plan per the requirements of this SOP and providing the plan to DMT for archiving.

## **6.0 PROCEDURE**

### **6.1 Sampling Plan Preparation**

The sampling plan is prepared by the SL or designee.

- 6.1.1 Determine sample locations, including QC samples, and consult with DMT for approved location sample names. Include a map when possible.
- 6.1.2 Determine sample analyses, DMT analyses codes, and analytical laboratory. Determine container and volume requirements using SOP 4.3. Consult with the QC Chemist for special analytical needs.
- 6.1.3 Provide sampling plan to DMT, QC Chemist, and field personnel for review. Ensure that appropriate sample IDs have been obtained from DMT.

## 6.2 Field Preparation

- 6.2.1 Review SOP 4.1, “General Instructions for Field Personnel,” and perform applicable preparation activities (i.e., arranging access to sampling areas through building coordinators, control point operators, security, or other appropriate personnel) and calibrating and decontaminating field equipment.
- 6.2.2 Inventory all field equipment listed in the Equipment Checklist (Attachment A) and load into field vehicle.
- 6.2.3 Locate sampling locations and determine the best sampling order. Sample from least contaminated area to most contaminated area whenever possible. If site historical data is unavailable, sample from the areas furthest from site operations, considered background, to areas closest to operations. Ensure that permission for offroad travel has been granted, if applicable, as described above (SOP 4.1, “General Instruction for Field Personnel”).

## 6.3 Surface Soil Sampling Procedure

- 6.3.1 Determine the location to be sampled and drive a labeled stake into the ground adjacent to where the soil will be collected. Be sure to not drive stake further than six inches into the ground unless a utility clearance and dig permit has been obtained.
- 6.3.2 Using a clean trowel, clear an area of vegetation large enough to supply the quantity of soil that will be needed for all analytical requirements. Usually a one ft<sup>2</sup> area is sufficient. Avoid removing the top soil when scraping off the vegetation.
- 6.3.3 If samples are to be analyzed for volatile chemical constituents, such as those using analytical methods EPA 8021 or 8260, a sampling device which limits the exposure of the matrix to air should be used if at all possible. The following procedure should be followed:
  - A. Using a soil sampling device, such as a slide hammer with cup and cap assembly, insert a clean liner into the cup, and drive the cup into the soil within the cleaned area. The cup is driven at a 45° angle to ensure the sampler does not obtain any soil from depths greater than six inches. The cup needs to be driven until it is certain that there is no air space remaining inside the cup assembly. The liner may be composed of either stainless steel or brass depending on the analysis being performed. Again, do not drive the cup further than six inches unless the dig permit has been issued.
  - B. Retrieve the cup from the ground and remove the liner filled with surface soil being careful not to let any of the soil fall out of the liner. Quickly inspect each end of the liner to ensure the soil extends to the end of the liner. Then

place a square of Teflon tape over the end of the tube followed by a plastic end cap. Repeat this for the other end of the tube and secure caps to the liner using duct tape to prevent the caps from falling off during shipment.

- C. Label the soil tube with the same identifier used to stake the location. Put sample in a air tight bag, and place in an ice chest with loose ice to maintain samples at 4°C. Loose ice should be replaced with double bagged ice or blue ice prior to shipment or courier pick-up (SOP 4.4).
  - D. If it is not possible to use a slide hammer sampling devise, samples may be collected by either directly driving a brass tube into the soil by hand or with a hammer, or by tightly packing soil into a glass jar. This should be performed quickly to prevent the loss of VOCs. Label and place on ice as described above.
  - E. For collection of QC samples, the soil core should be collected adjacent to the original sample and packaged in exactly the same manner for shipment to the analytical laboratory. Refer to SOP 4.9, "Collection of Field QC Samples" for sample ID instructions.
- 6.3.4 Samples being analyzed for non-volatile chemical constituents or physical characteristics may be collected without concern about the exposure to air. The following procedure should be followed:
- A. Using the trowel, chop and stir up the soil within the cleared area down to about 6 inches. It should be thoroughly mixed up to ensure that a representative composite sample can be collected.
  - B. Fill the appropriate number of containers as determined by the analytical requirements (SOP 4.3). A Teflon™-lined lid or cap should be used to seal the container. If these are not available, Teflon\* sheeting may be placed over the , top of the container prior to sealing with a conventional cap. The cap should be taped in place to prevent it from coming off during shipment.
  - C. Label the container as described above. Place the sample in a air tight bag and in an ice chest as described above to maintain samples at 4°C (SOP 4.4).
  - D. For collection of QC samples, insure that enough soil is composited in the area to fill the additional QC containers. As described above, the samples should be packaged in the same manner as the routine samples. Refer to SOP 4.9, "Collection of Field QC Samples" for sample ID instructions.
- 6.3.5 Record all pertinent information in the document control logbook including sample ID, location description, the number and types of samples collected (SOP 4.2).
- 6.3.6 Mark the sampling location and ID on a topographic site map as accurately as possible. The locations coordinates can either be determined through surveying, a ground positioning system (GPS), or estimated by utilizing the Hot Maps application within the Gemini web tools.
- 6.3.7 Decontaminate the slide hammer assembly and/or trowel (SOP 4.5, "General Equipment Decontamination") prior to moving to the next sampling location. Equipment used in background locations and those locations not containing organic contaminants can be decontaminated just by thoroughly rinsing with deionized water and drying with a clean cloth.

## 6.4 Post Operation

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6.4.1 Perform post operation activities described in SOP 4.1.

## **7.0 QA RECORDS**

7.1 Document Control Logbook

7.2 Chain-of-Custody Forms

## **8.0 ATTACHMENTS**

Attachment A—Equipment Checklist

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**Attachment A**

**Equipment Checklist**

## Equipment Checklist

- \_\_\_ Air-tight plastic bags
- \_\_\_ Alconox (detergent)
- \_\_\_ Appropriate documents (i.e., Sampling Plan, SOPs, QAPP, Site Safety Plan)
- \_\_\_ Backpack
- \_\_\_ Brushes
- \_\_\_ De-ionized water
- \_\_\_ Disposable towels
- \_\_\_ Fluorescent marker tape
- \_\_\_ Gloves (leather, vinyl, and/or Nitrile)
- \_\_\_ Ice chest and ice
- \_\_\_ Logbook
- \_\_\_ Maps
- \_\_\_ Permanent ink markers
- \_\_\_ Portable 2-way radio
- \_\_\_ Sample containers
- \_\_\_ Shovel
- \_\_\_ Sledge hammer
- \_\_\_ Stakes
- \_\_\_ Trash bags
- \_\_\_ Trowel
- \_\_\_ Split spoon sampler and slide hammer
- \_\_\_ Snake chaps
- \_\_\_ FID or PID or other appropriate monitoring devices
- \_\_\_ Appropriate attire (i.e., coveralls, hat, etc.)
- \_\_\_ Drinking water